UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice **May/June 2012**

45 Minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

7094438313

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
You may use a calculator.

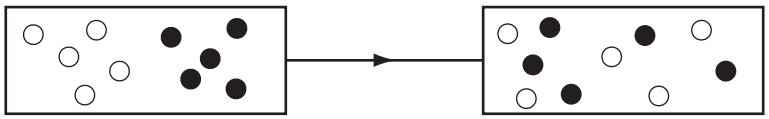
This document consists of **16** printed pages.

1 Which diagram shows the process of diffusion?

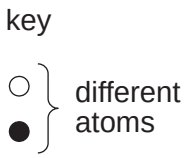
A

B

C



D



2 A student investigates how the concentration of an acid affects the speed of reaction with a 0.5 g mass of magnesium at 30 °C.

The student has a beaker, concentrated acid, water and the apparatus below.

P a balance

Q a clock

R a measuring cylinder

S a thermometer

Which pieces of apparatus does the student use?

A P, Q and R only

B P, Q and S only

C Q, R and S only

D P, Q, R and S

3 Which method is most suitable to obtain zinc carbonate from a suspension of zinc carbonate in water?

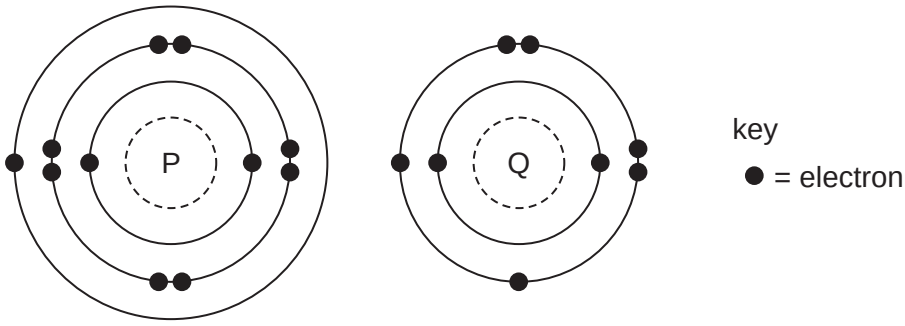
A crystallisation

B distillation

C evaporation

D filtration

4 The electronic structures of atoms P and Q are shown.



P and Q react to form an ionic compound.

What is the formula of this compound?

A PQ_2 **B** P_2Q **C** P_2Q_6 **D** P_6Q_2

5 An element Y has the proton number 18.

The next element in the Periodic Table is an element Z.

Which statement is correct?

A Element Z has one more electron in its outer shell than element Y.

B Element Z has one more electron shell than element Y.

C Element Z is in the same group of the Periodic Table as element Y.

D Element Z is in the same period of the Periodic Table as element Y.

6 Which atom has twice as many neutrons as protons?

A $^{1}_{1}H$ **B** $^{2}_{1}H$ **C** $^{3}_{1}H$ **D** $^{4}_{2}He$

7 Which is a simple covalent molecule?

	conducts electricity		volatile
	when solid	when molten	
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

8 The equation for the reaction between magnesium and dilute sulfuric acid is shown.

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$$

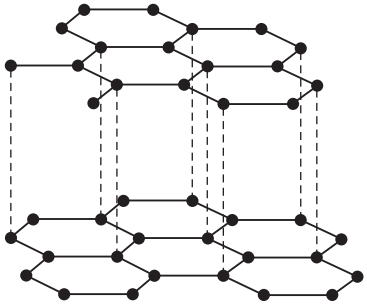
M_r of $MgSO_4$ is 120

Which mass of magnesium sulfate will be formed if 12 g of magnesium are reacted with sulfuric acid?

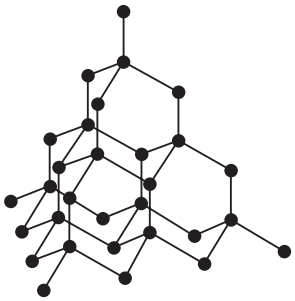
A 5 g **B** 10 g **C** 60 g **D** 120 g

9 The diagrams show the structures of two forms, P and Q, of a solid element.

P



Q

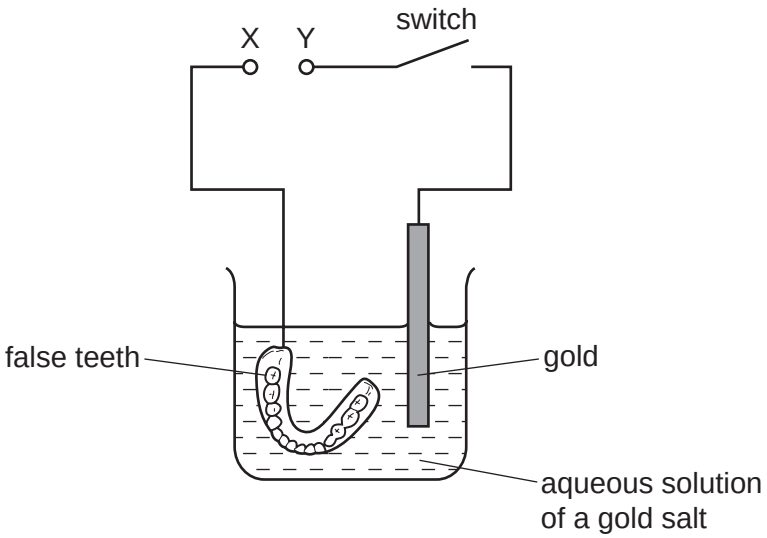


What are suitable uses of P and Q, based on their structures?

	use of solid P	use of solid Q
A	drilling	drilling
B	lubricating	drilling
C	drilling	lubricating
D	lubricating	lubricating

10 Winston Churchill, a British Prime Minister, had his false teeth electroplated with gold.

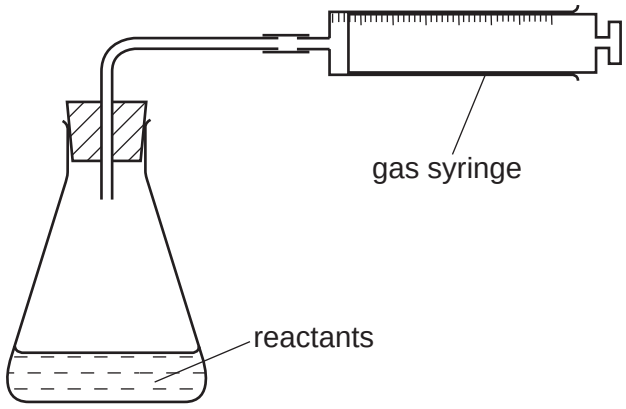
The teeth were coated with a thin layer of carbon and were then placed in the apparatus shown.



Which row is correct?

	terminal X is	the carbon powder could be
A	negative	diamond
B	negative	graphite
C	positive	diamond
D	positive	graphite

11 The apparatus shown is used to measure the speed of a reaction.



Which equation represents a reaction where the speed can be measured using this apparatus?

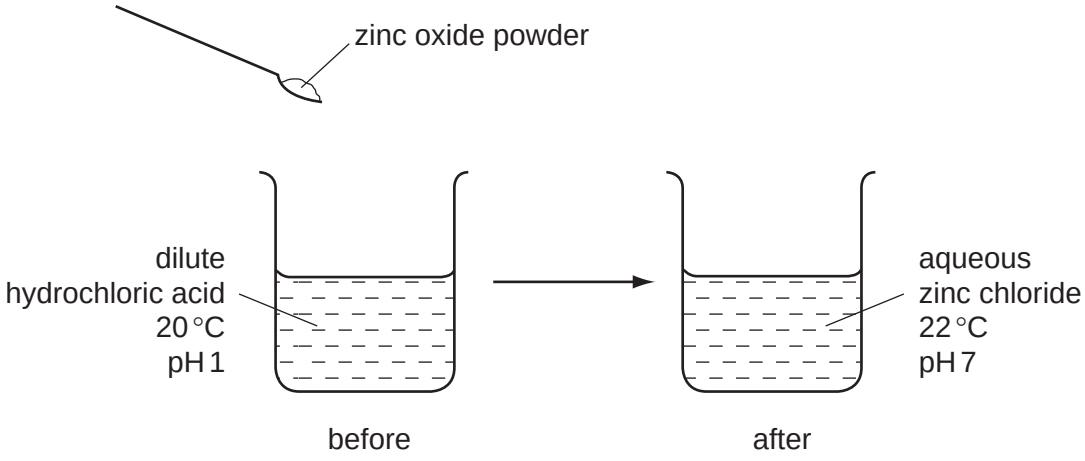
A $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

B $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

C $Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$

D $2Na(s) + Br_2(l) \rightarrow 2NaBr(s)$

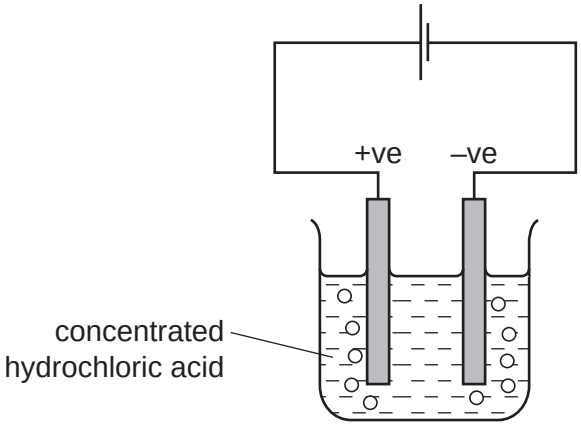
12 The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.



Which terms describe the reaction?

	endothermic	neutralisation
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

13 The diagram shows that two gases are formed when concentrated hydrochloric acid is electrolysed using inert electrodes.



Which row correctly describes the colours of the gases at the electrodes?

	anode (+ve)	cathode (–ve)
A	colourless	colourless
B	colourless	yellow-green
C	yellow-green	colourless
D	yellow-green	yellow-green

14 A gas is escaping from a pipe in a chemical plant.

A chemist tests this gas and finds that it is alkaline.

What is this gas?

A ammonia

B chlorine

C hydrogen

D sulfur dioxide

15 The element vanadium, V, forms several oxides.

In which change is oxidation taking place?

A $VO_2 \rightarrow V_2O_3$

B $V_2O_5 \rightarrow VO_2$

C $V_2O_3 \rightarrow VO$

D $V_2O_3 \rightarrow V_2O_5$

16 Dilute hydrochloric acid is added to a solid, S.

A flammable gas, G, is formed. Gas G is less dense than air.

What are S and G?

	solid S	gas G
A	copper	hydrogen
B	copper carbonate	carbon dioxide
C	zinc	hydrogen
D	zinc carbonate	carbon dioxide

17 The results of three tests on a solution of compound X are shown in the table.

test	result
aqueous sodium hydroxide added	white precipitate formed, soluble in excess
aqueous ammonia added	white precipitate formed, insoluble in excess
acidified silver nitrate added	white precipitate formed

What is compound X?

A aluminium bromide

B aluminium chloride

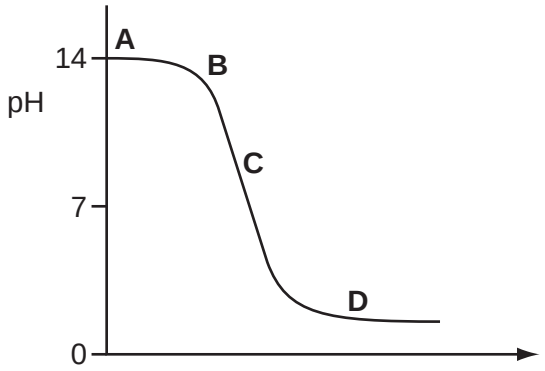
C zinc bromide

D zinc chloride

18 The graph shows how the pH changes as an acid is added to an alkali.

$$\text{acid} + \text{alkali} \rightarrow \text{salt} + \text{water}$$

Which letter represents the area of the graph where both acid and salt are present?



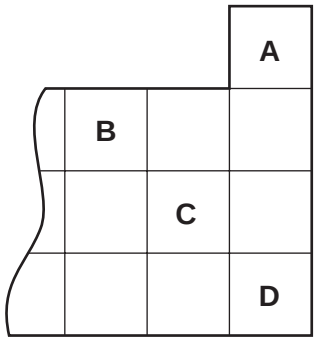
19 Which properties of the element titanium, Ti, can be predicted from its position in the Periodic Table?

	can be used as a catalyst	conducts electricity when solid	has low density	forms coloured compounds
A	✓	✓	✗	✓
B	✓	✓	✓	✗
C	✓	✗	✓	✓
D	✗	✓	✓	✓

20 The diagram shows a section of the Periodic Table.

Which element is described below?

'A colourless, unreactive gas that is denser than air.'



21 Element X is below iodine in the Periodic Table.

Which row correctly shows the physical state of element X at room temperature and its reactivity compared with that of iodine?

	physical state of element X at room temperature	reactivity compared with that of iodine
A	gas	less reactive
B	solid	less reactive
C	gas	more reactive
D	solid	more reactive

22 Which property is shown by **all** metals?

A They are extracted from their ores by heating with carbon.

B They conduct electricity.

C They form acidic oxides.

D They react with hydrochloric acid to form hydrogen.

23 Five elements have proton numbers 10, 12, 14, 16 and 18.

What are the proton numbers of the three elements that form oxides?

A 10, 12 and 14

B 10, 14 and 18

C 12, 14 and 16

D 14, 16 and 18

24 Metal X reacts violently with water.

Metal Y reacts slowly with steam.

Metal Z does not react with dilute hydrochloric acid.

What is the correct order of reactivity of these metals, most reactive first?

A $X \rightarrow Y \rightarrow Z$

B $X \rightarrow Z \rightarrow Y$

C $Z \rightarrow X \rightarrow Y$

D $Z \rightarrow Y \rightarrow X$

25 Which statement about the extraction of iron from its ore is correct?

A Iron is more difficult to extract than zinc.

B Iron is more difficult to extract than copper.

C Iron is easy to extract because it is a transition metal.

D Iron cannot be extracted by reduction with carbon.

26 Which statement about the uses of metals is correct?

A Aluminium is used in the manufacture of aircraft as it has a high density.

B Aluminium is used to make food containers as it conducts electricity.

C Stainless steel for cutlery is made by adding other elements to iron.

D Stainless steel is used to make chemical reactors as it corrodes readily.

27 Fertilisers need to supply crops with three main elements.

Which compound contains all three of these elements?

A H_3PO_4 **B** KNO_3 **C** $NH_4K_2PO_4$ **D** NH_4NO_3

28 Some uses of water are listed.

1 for drinking

2 in chemical reactions

3 in swimming pools

4 in washing

For which uses is it necessary to chlorinate the water?

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

29 Which is a use of oxygen?

A filling balloons

B filling light bulbs

C food preservation

D making steel

30 Coal is a fossil fuel.

Which gas is **not** formed when coal burns?

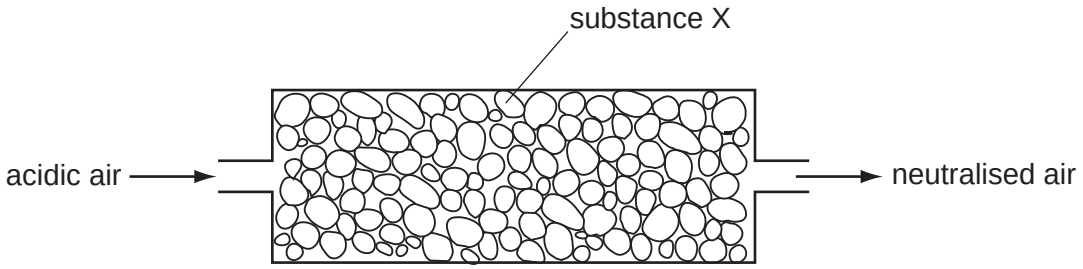
A carbon dioxide

B carbon monoxide

C methane

D sulfur dioxide

31 Air containing an acidic impurity was neutralised by passing it through a column containing substance X.



What is substance X?

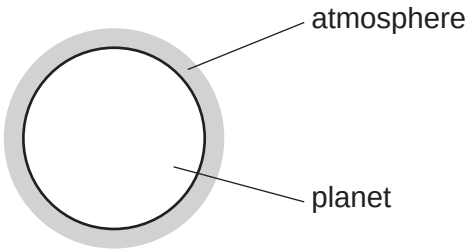
A calcium oxide

B sand

C sodium chloride

D concentrated sulfuric acid

32 A new planet has been discovered and its atmosphere has been analysed.



The table shows the composition of the atmosphere.

gas	percentage by volume
carbon dioxide	4
nitrogen	72
oxygen	24

Which gases are present in the atmosphere of the planet in a higher percentage than they are in the Earth's atmosphere?

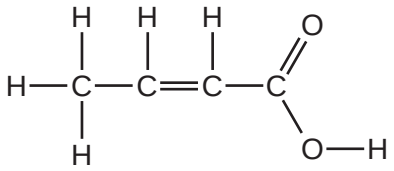
A carbon dioxide and oxygen

B carbon dioxide only

C nitrogen and oxygen

D nitrogen only

33 The structure of a compound is shown.



Which functional groups are present in this compound?

	alcohol	alkene	carboxylic acid
A	✓	✓	✓
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

34 Gas X is a waste gas from digestion in animals.

Gas Y is formed when gas X is burnt with a small amount of oxygen.

Gas Z is formed when gas X is burnt with an excess of oxygen.

What are X, Y and Z?

	X	Y	Z
A	carbon dioxide	methane	carbon monoxide
B	carbon monoxide	methane	carbon dioxide
C	methane	carbon dioxide	carbon monoxide
D	methane	carbon monoxide	carbon dioxide

35 Which fraction from the fractional distillation of petroleum does **not** match its correct use?

	fraction	use
A	fuel oil	domestic heating
B	kerosene	jet fuel
C	naphtha	making roads
D	refinery gas	for heating and cooking

36 When a long chain hydrocarbon is cracked, the following products are produced.

1 C_3H_8

2 C_2H_4

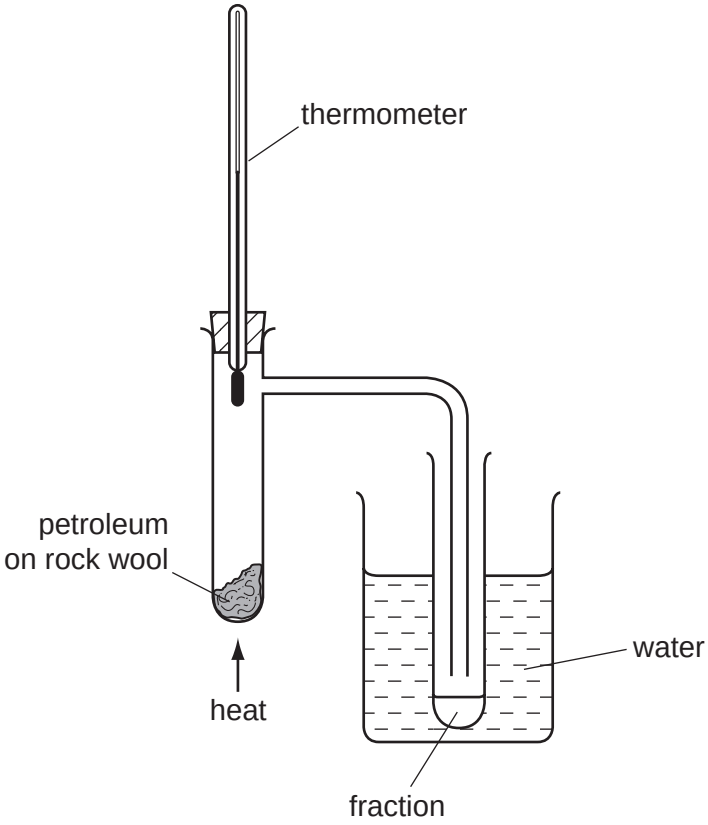
3 C_3H_6

4 C_2H_6

Which products would decolourise bromine water?

A 1 and 4 **B** 2 and 3 **C** 2 only **D** 3 only

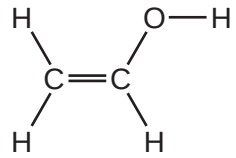
37 The diagram shows apparatus used to separate petroleum into four fractions.



Which fraction contains the smallest hydrocarbon molecules?

fraction	boiling point range / °C
A	up to 70
B	70 to 120
C	120 to 170
D	over 170

38 PVA is a polymer. The monomer has the structure shown.



To which homologous series does this compound belong?

	alcohols	alkenes
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

39 Ethanol is an important chemical produced by the ……1…… of ……2…… .

Which words correctly complete gaps 1 and 2?

	1	2
A	combustion	ethane
B	combustion	glucose
C	fermentation	ethane
D	fermentation	glucose

40 Which equation represents incomplete combustion of ethane?

A $C_2H_6 + O_2 \rightarrow 2CO + 3H_2$

B $C_2H_6 + 2O_2 \rightarrow 2CO_2 + 3H_2$

C $2C_2H_6 + 5O_2 \rightarrow 4CO + 6H_2O$

D $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

DATA SHEET
The Periodic Table of the Elements

Group																		
I	II										III	IV	V	VI	VII	0
																4 **He** Helium 2
					1 **H** Hydrogen 1											
7 **Li** Lithium 3	9 **Be** Beryllium 4										11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
23 **Na** Sodium 11	24 **Mg** Magnesium 12										27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	64 **Cu** Copper 29	65 **Zn** Zinc 30	70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
85 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	**Tc** Technetium 43	101 **Ru** Ruthenium 44	103 **Rh** Rhodium 45	106 **Pd** Palladium 46	108 **Ag** Silver 47	112 **Cd** Cadmium 48	115 **In** Indium 49	119 **Sn** Tin 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La** Lanthanum 57 *	178 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80	204 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**Pm** Promethium 61	150 **Sm** Samarium 62	152 **Eu** Europium 63	157 **Gd** Gadolinium 64	159 **Tb** Terbium 65	162 **Dy** Dysprosium 66	165 **Ho** Holmium 67	167 **Er** Erbium 68	169 **Tm** Thulium 69	173 **Yb** Ytterbium 70	175 **Lu** Lutetium 71
232 **Th** Thorium 90	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).